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ABSTRACT

A study investigated the effects of training in the use of graphic organizers on the summarization strategies of disabled readers. Subjects, 21 disabled readers (with a mean age of 13 years, 7 months) from a reading clinic, received 5 hours of training in the use of graphic organizers to map expository passages. Instruction included training in text structure macrorules, modeling of the mapping procedure, and individual student practice with feedback on results. Posttest results indicated significant improvement in subjects' ability to identify levels of important ideas in text structure, to identify main idea statements, and to summarize expository text. (Forty references, one table of data, and a sample reading passage and student graphic organizer are attached.) (Author/RS)

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EFFECTS OF TRAINING IN CONSTRUCTING GRAPHIC ORGANIZERS ON DISABLED READERS' SUMMARIZATION AND RECOGNITION OF EXPOSITORY TEXT STRUCTURE

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EFFECTS OF TRAINING IN CONSTRUCTING GRAPHIC ORGANIZERS ON DISABLED READERS' SUMMARIZATION AND RECOGNITION OF EXPOSITORY TEXT STRUCTURE

ABSTRACT

The study investigated the effects of training in use of graphic organizers on the summarization strategies of disabled readers. After pretesting, a reading clinic population of 21 disabled readers with a mean age of 13 years, 7 months, received five hours of training in use of graphic organizers to map expository passages. Instruction included training in text structure macrorules, modeling of the mapping procedure, and individual student practice with feedback on results. Posttest results indicated significant improvement in subjects' ability to identify levels of important ideas in text structure. The most dramatic improvement was found in ability to identify main idea statements. In addition, subjects' ability to summarize expository text improved.

EFFECTS OF TRAINING IN CONSTRUCTING GRAPHIC ORGANIZERS ON DISABLED READERS' SUMMARIZATION AND RECOGNITION OF EXPOSITORY TEXT STRUCTURE

Background

This study was prompted by a concern for identification of those factors which lead to improvement in disabled readers ability to comprehend expository text. In particular, it addressed the question of how the use of a hierarchical, generative learning strategy such as constructing graphic organizers can help readers improve their metacognitive ability to identify importance level and to summarize ideas found in expository text.

Identification of important ideas is carried out by readers based on two sets of criteria, reader-based and text-based criteria (Van Dijk, 1979). Reader-based, or contextual, criteria reflect what is important to the individual reader. These criteria include the reader's purpose for reading (Anderson & Pearson, 1984), prior knowledge (Afflerbach, 1986, 1987), and emotional response to the content (Martins, 1982).

Text-based criteria for importance identification are largely signaled by text structure, though authors can use other types of metadiscourse such as attitudinal and informational comments to signal importance (Crismore & Hill, 1988). In order to adequate assign importance and comprehend, readers must be

able to recognize the top-level structure of expository text using signal words and transitional statements and common organizational patterns (Meyer, 1979; Taylor, 1980).

Much recent research in reading comprehension has indicated that readers' importance assignment ability--their ability to recognize important ideas in text--is an important factor in general comprehension and recall (Brown & Day, 1983; Brown, Day, and Jones, 1983; McNeil & Donant, 1982; Taylor, 1982; Winograd, 1984; Wittrock, 1982). Freebody and Anderson (1986) found that readers' rating of importance of propositions in text predicts much of the variance in their recall of those propositions.

Meyer, Brandt, and Bluth (1980) have suggested that readers use the top-level structure of text to search for relations that link information into some cohesive whole. Readers who are unaware of structure employ an unorganized or serially organized encoding of information that results in an almost random retrieval of ideas, and thereby inhibits comprehension.

Ability to summarize has been of key concern to researchers investigating importance assignment. Kintsch and van Dijk (1978) have noted the importance of readers' ability to construct "second-order discourse," text produced with respect to other texts, such as recalls, summaries, and critiques. Rinehart, Stahl, and Erickson (1986) found that direct instruction in summarizing heightened student awareness of top-level information.

Brown and Day (1983) conducted several studies of student summarization ability. They developed a hierarchical set of summarizing rules based on Kintsch and van Dijk's (1978)

comprehension macrorules. Briefly, the summarizing rules are:

1. delete material that is unimportant
2. delete material that is repetitive
3. substitute a superordinate term for a subordinate term
4. select the topic sentence
5. invent a topic sentence if the paragraph has none

Subjects in the studies were in the fifth, seventh, and tenth grades and in college. Brown and Day found an age by rule effect, in that the higher the level of the rule the fewer were the subjects able to apply it. Even college students used the invention rule only half the time in their summaries. Brown and Day concluded that the ability to use text information so that it can be abstracted, reduced, and reorganized into a summary requires higher levels of thinking and reading ability than is generally assumed.

Ability of students to function independently in assigning importance and constructing summaries is an important skill. Both Braddock (1974) and Baumann and Serra (1984) have found that authors infrequently present explicit main idea statements in expository text. This places the burden upon the individual reader. Schallert and Tierney (1981) have also found that in real-life classroom material, authors rarely follow an explicitly stated organization pattern.

Niles (1965) called for the explicit teaching of text organizational patterns to students, but there is some concern that identification of important ideas is not being well taught in classrooms. Moore and Smith (1987), for example, examined

developmental reading textbooks at the secondary level. They found no evidence of any systematic, sequenced instruction about main ideas that progressed from simple to complex and that resulted in eventual transferral of responsibility to students.

Researchers have examined a variety of methods to help students improve comprehension through improved ability to identify importance. Some benefits can be gained through considerate construction of textual materials. Baumann (1986), for example, found that comprehension is improved when science texts are rewritten so that main ideas are cued by headings, italicized, appear at the beginning of text units, and made explicit.

Yet teachers cannot depend upon considerate materials. The crucial issue of independence of importance assignment ability--the ability of students to function in finding and using main ideas even when text is not considerate--has been raised by Moore and Smith (1987). It is among poorer readers that inability to recognize important ideas is seen most often.

Poorer readers are less well able to identify importance of ideas in a reading passage (Dunn, Mathews, & Bieger, 1979; Eamon, 1978; Garner, 1985) than better readers. Poorer readers do not make optimal use of text structure for recall (McGee, 1982; Smiley, et al., 1977). Both Meyer, Brandt and Bluth (1980) and Taylor (1980) found that good readers are more likely to use use top-level structure to aid recall. The oral recall of poorer readers was less well organized.

Winograd (1984) worked with good and poor readers in 8th grade and found that poor readers had difficulty using

summarization rules effectively in part because they have difficulty identifying important ideas in passages. Poorer readers seemed to assign importance to sentences that are personally interesting, while better readers identified important sentences according to their information. Even when poorer readers did correctly assign importance, there was a tendency for them to neglect to include these important ideas in their summaries.

Explicitly stated organizational relationships can improve the comprehension of poorer readers (Marshall & Glock, 1978-1979), but as noted above, little classroom textual material is constructed in this fashion. In a series of three previous instructional studies, the authors of the present study worked with disabled readers, attempting to help them develop strategies for improving their comprehension of expository text, in particular their ability to identify importance levels of statements within passages. In the first two studies (Weisberg & Balajthy, 1983), 24 disabled readers were trained in a modified version of Brown and Day's (1983) summarization macrorules. The students were taught to identify and underline sentences representing the following three levels of text structure with different colored pencils: Less important details (blue), important facts (red) and main ideas (black).

Findings indicated that students could be taught to improve their ability to recognize levels of importance within highly structured expository passages. However, extra training was necessary to achieve significant improvement in differentiating

important fact statements from less important detail statements.

A third study (Weisberg & Balajthy, 1984) focused on helping these same disabled readers write better summaries based on their identification of main ideas and important facts in passages. Results indicated that post-training summaries contained significantly more main ideas and important facts than did the students' pre-training summaries.

When the posttest summaries were analyzed more closely, however, it was obvious students had used a delete and copy strategy. That is, they simply copied the sentences containing the main idea and important facts word-for-word for their summaries. Both the researchers and the students' teachers recognized the need for students to generate summaries in their own words, making summarization a more involved cognitive task.

In a preliminary attempt, the passages were removed from students' view once the underlining procedure had been carried out, in order to force writing of the summaries in the students' own words. These reading disabled students were unable to function under those circumstances. An intermediate step in the summarization process was needed. Other studies had investigated the use of hierarchically organized graphic organizers to enhance readers' comprehension and recall (Berkowitz, 1986; Boothby & Alvermann, 1984; Reutzel, 1984; Sinatra, Stahl-Gemake, & Berg, 1984). This organizational device has also been called a semantic map (Sinatra, Stahl-Gemake, & Berg, 1984) and a pyramid (Solon, 1980; Clewell & Haidemos, 1983).

The present study was undertaken to answer several questions. First, can the use of graphic organizers as a

learning strategy improve disabled readers' ability to assign levels of importance to explicitly stated ideas in expository text? Second, does the ability to select more important ideas in expository passages improve readers' written summaries? Third, would these learning strategies improve subjects' comprehension, as measured by a multiple choice test? Finally, it was hoped that if the results were positive, an examination of the measures obtained in the study would give some indications as to how that improvement occurred.

Method

Subjects

Training was carried out with 25 students, the two classes of junior high school age students attending a full-time, ungraded clinical school for the reading/learning disabled. Each student had been previously classified as reading disabled on the basis of reading achievement test scores at least two grade levels below expectancy. For the analyses of the results, 4 students were dropped from the study due to poor attendance during training sessions.

The subjects' mean age was 13 years, 7 months. Their mean IQ on the WISC-R was 99. Their mean score on the reading subtest of the Stanford Achievement Test was equivalent to the 5.6 grade level.

Training Procedures

Subjects received five days of training, for one hour per day. In a typical training exercise, subjects first had to identify the passage's main idea and important idea sentences by applying the macrorule underlining procedures explained above (similar to Brown and Day's 1983 procedures). Subjects had been taught these macrorule procedures prior to the start of the study.

After that, students constructed a hierarchical graphic organizer to reflect the passage's top level ideas. They incorporated the ideas they had just underlined into their graphic organizers. The graphic organizers consisted of boxes, within which ideas from the passage were recorded in telegraphic writing--short phrases or clauses that condensed the sentence information. The final step was to write a summary based on their graphic organizers. Subjects were taught the procedure on the first day, and they practiced and received feedback on the procedure for the remainder of the training sessions.

Constructing graphic organizers with telegraphic writing was taught as a four-step procedure (see Figure 1). First, after subjects had identified levels of importance in passages by their underlining, they drew a long rectangle at the top of the page and two or more rectangles at a lower level on the page. These rectangles were arranged to reflect the paragraph structure and formed the outline for the students' graphic organizers.

Second, subjects had to re-read the sentences they had identified as the passage's main idea and important facts. The

critical elements in the sentence were reduced to a few key words as if they were going to be put into a telegram. The researchers offered many examples during training to demonstrate how a few words can contain the statement s essential information.

Next, students wrote the contents of each rectangle by first condensing the passage s main idea into a phrase or clause and writing it in the top rectangle of their maps. They continued with the same procedure by writing the passage s important facts in the lower rectangles.

Fourth, students drew arrows from the map s top rectangle containing main idea information down to the two or more rectangles on the next lower level containing important fact information that supported the main idea. This was done to emphasize the levels of importance.

At this point in the training procedure, original passages were removed. Subjects then wrote summaries in complete sentences using only the telegraphic phrases in their graphic organizers as their guides. For the purpose of this study, summarizing was operationally defined as inclusion of those ideas from the text that were specifically identified as important within the top-levels of text structure by two reading specialists.

The original passages were then returned to students who received feedback from the researchers about: (a) the levels of importance in passages; (b) information that should have been included in graphic organizers and summaries; (c) and reasons for these decisions. During this daily feedback procedure, subjects

indicated by their discussion, as well as from the information included in their maps and summaries, increased sensitivity to important ideas in passages, and improved ability to write summaries that synthesized passage information.

Testing

A pretest-posttest design was used due to school administrative restrictions on the design of the study, as well as the small size of the school and the unique characteristics of the clinical population at the school. Pretesting prior to the training sessions required subjects to: (1) Read 2 passages; (2) differentiate levels of importance in passages by underlining less important details in blue, important facts in red, and main ideas in black; (3) write summaries of the passages with passages removed; and (4) take a multiple-choice comprehension test.

Passages (see Appendix for example) were adapted from fourth grade social studies texts. Mean readability was sixth grade (Fry, 1977). The passages ranged in length from 78 to 118 words, with a mean of 92 words. As necessary, passages were rewritten to have one stated main idea somewhere within the passage, at least two important facts supporting the main idea, and several less important details, each of which related to one of the important facts. While these tightly organized adapted texts were not representative of most classroom reading materials, which are less well organized, the highly organized exposition was deemed desirable for enhancing a controlled study designed to analyze the relationship between the contents' hierarchical

levels of importance.

Posttests required subjects to read 2 new passages. Procedures were identical to the pretesting except that all subjects constructed graphic organizers as an intermediate step between underlining and writing summaries.

In order to ensure equivalence of pre- and posttest administrations, the four testing passages were given to students in counterbalanced order both within and between administrations. That is, half the subjects were given two passages as a pretest, while the other half received the other two passages. For the posttest, subjects received the two passages they had not read in the pretest.

Scoring

Three general measures were obtained for each pretest and posttest, an importance assignment score, a quality of summarizing score, and a multiple choice comprehension test score. Scores were further divided according to level of importance.

There were two percentage scores reflecting subjects' accuracy in their assigning of levels of importance of passage information, one for main ideas and one for important facts. These scores were obtained from subjects' underlinings of passage contents. Main ideas were underlined in black, important facts in red, and less important details in blue. Underlinings were matched to the template of idea units previously identified as

being main idea and important fact, respectively.

Written summaries were scored against a template of idea units listed on a master list. The master list of idea units were obtained by parsing the text into idea units and rating their relative importance, on a three level scale from main idea to important fact to less important detail. This parsing and rating was carried out in accordance with the technique described by Johnson (1970). Two scores were obtained for each subject, at the main idea level and at the important fact level. Each score was the percentage of items on the template list at that level which had been included in the summary.

Finally, a percentage score was derived for comprenension, based on multiple choice test questions. The questions dealt with passage information at two levels of structural importance, main ideas and important facts.

Results

Data were analyzed with three separate analyses of variance, one each for assignment of levels of importance, inclusion of important passage information in the summary, and immediate retention. Each analysis was a repeated-measures ANOVA with two factors. Factor 1 was Test (pre and post). Factor 2 was Level of Importance (main idea, important facts, and in the underlining analysis only, less important details). Mean scores, broken down by level of structural importance within the passages, are reported in Table 1.

The first ANOVA dealt with the assignment of levels of

importance and was based on the underlining task. A significant main effect was indicated for test, F (1, 20) = 8.08, $p < .01$, showing overall improvement between pretest and posttest. Subjects' scores increased an average of about 15 percentage points on the posttest. Subjects improved in ability to identify both levels of structural importance, main idea and important facts. The average total underlining score on the pretest was 67.92% and on the posttest 82.16%. There was no main effect for level nor was any interaction found.

The second ANOVA dealt with the inclusion of important passage information and was based on the summarizing task. A significant main effect was indicated for test, F (1, 20) = 6.86, $p < .05$, showing overall improvement between pretest and posttest. Subjects' scores at each level increased an average of about 15 percentage points on the posttest. Again, subjects improved in including material from both levels of structural importance, main ideas and important facts, in their summaries. The average total summarizing score on the pretest was 58.33% and on the posttest 73.81%. There was no main effect for level nor was any interaction found.

The third ANOVA dealt with immediate retention of passage information and was based on the multiple choice test. The test items dealt with passage information at the top two levels of structural importance, main ideas and important facts. There were no significant differences between subjects' pre- and posttests. The average total multiple-choice test score on the pretest was 84.10% and on the posttest it was 83.48%.

Discussion

The practical and significant results of this study suggest the usefulness of these generative learning strategies for disabled readers. The ability to synthesize information into meaningful and yet manageable chunks and the ability to organize concepts in order to generate even two or three sentences that accurately summarized passage information was a giant step for these disabled readers.

Earlier studies by the authors with similar populations of students had indicated that the underlining training in identification of levels of importance within text could enhance students' summary writing (Weisberg & Balajthy, 1983, 1984) by increasing their awareness of the differences between important and less important ideas. The addition of the graphic organizer task, interposed between underlining and summary writing, provided even more enhancement of summarization ability. In addition, the graphic organizer training also apparently worked backwards to improve the ability of students to identify levels of importance in their underlining tasks. One picture can really be worth a thousand words--especially for a disabled reader, for whom words are not always "user-friendly."

One additional benefit of the graphic organizer task was to encourage students to use their own wording when writing summaries. Earlier attempts by the authors to improve summarizing had resulted in students using the wording of the text passage. In those studies, completely withdrawing the

passage from the students' sight had resulted in very poor performance with this disabled population. In the present study, the passage was removed from sight and the students used their telegraphic writing in their graphic organizers as cues for writing the summary. It was apparent from student comments and later performance reported by their teachers that this procedure gave them a clearer concept of just what is meant by the common instruction, "Write the summary in your own words."

Lack of improvement on the comprehension posttest was consistent with previous findings by the authors. One problem created by the short attention spans of the students and the time constraints imposed by the school was that the multiple choice tests were short (five to six items) and not highly reliable. It seems unlikely, with such improvement in the ability of subjects to identify main ideas and in their ability to write summaries, that a more sensitive measure of comprehension would fail to indicate improvement. In addition, comprehension testing was not a focus of the study, and students had not taken such tests during their training sessions.

One further finding of importance was the improvement in ability to identify main idea statements. Earlier studies by the authors (Weisberg & Balajthy, 1983, 1984) had found that the underlining training alone did improve students' ability to identify ideas at the important fact and less important detail level, but not at the main idea level. The use of graphic organizers in the present study yielded positive results in ability to assign level of importance at all three levels. In

fact, gains were most impressive at the main idea level.

The significant main effects for underlining suggest use of graphic organizers improved subjects' identification of levels of importance in expository passages, especially their identification of main ideas. In previous studies with similar populations, the important difference in main idea identification had not been found. However, those studies had not included graphic organizers (Weisberg & Balajthy, 1983, 1984).

Finally, the reaction of both teachers and students to the training was positive. Students appreciated the usefulness of being able to identify and summarize main ideas, hoping that this would help them improve their ability to take reading tests. They also found the construction of the graphic organizers to be enjoyable. Teachers were especially appreciative of learning a method that integrated writing with reading. They reported that the text structure knowledge would be easily transferable to instruction in how to organize compositions. They also continued to use the graphic organizer procedures in the students' content area reading lessons after the conclusion of the study.

In addition, the use of adapted passages raises the issue of whether student learning will transfer to other classroom tasks. The control possible with highly structured passages lent itself to this study, for the purpose of the study was not simply to determine whether the underlining task and graphic organizers are effective (previous studies had determined that) but to examine the relationship between the levels of concept importance in expository text structure and the use of the underlining task and graphic organizers.

Several suggestions for future research can be made. First, the limited number of students in the school and its unique clinical population dictated use of a pretest-posttest design, which limits generalizability. Second, it may well be that able readers do not benefit from this very specific training because they already have developed the targeted abilities. Research is needed on different populations. Third, only one text structure was used in the present study. The complexity of expository text rests largely in the fact that authors use a variety of structures, and it would be useful to use a variety of assessment devices to determine how these findings apply to other structures, such as comparison-contrast and cause-effect. Such research would profit from a variety of assessment methods (Richgels, McGee, Lomax, & Sheard, 1987), as well as attention to prior knowledge (Horowitz, 1982). Fourth, the highly structured adapted passages used in this study do not reflect typical organization of textbooks. Examination of students' ability to transfer what they have learned to real-world materials, and examination of instructional methods that enhance this transfer, must be carried out.

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TABLE 1. PERCENTAGE CORRECT--MEAN SCORES

	Pretest			Posttest		
	Underlining (s.d.)	Summarizing (s.d.)	Multiple Choice (s.d.)	Underlining (s.d.)	Summarizing (s.d)	Multiple Choice (s.d.)
Main Idea	61.91 (21.82)	64.29 (35.86)	80.95 (23.59)	83.33 (24.15)	71.43 (29.88)	82.14 (21.13)
Important Fact	66.67 (25.41)	52.38 (39.45)	87.24 (23.63)	77.38 (29.48)	76.19 (32.09)	84.81 (19.53)
Less important Detail	75.19 (29.82)			85.76 (19.88)		

APPENDIX

The different states in the United States are different in the natural resources they have--things found in and on the earth that are useful to people. Trees are a major natural resource for making buildings and paper products. The states of Oregon, California and Washington are the leading producers of lumber. Oregon produces over 600 million cubic feet of lumber per year, while California produces almost 500 million cubic feet. Another major natural resource is oil, which is used to make fuels to run our cars and heat our homes. Texas, Alaska and Louisiana are the leading producers of oil. Texas pumps 1000 million barrels of oil a year, while Alaska produces 600 million barrels per year.

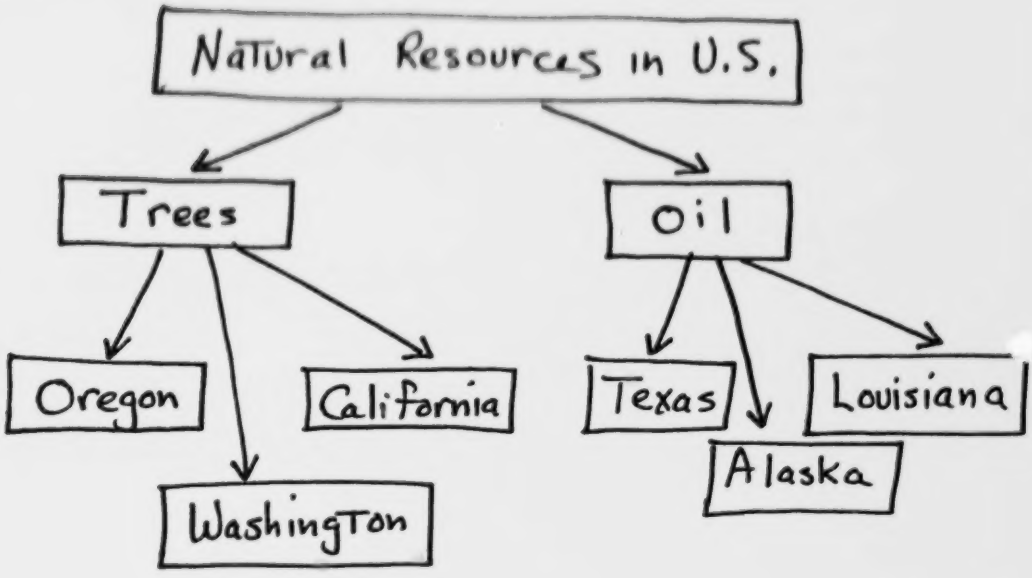

Figure 1. Sample student graphic organizer.